Statement of

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Mr. Chairman and other Members of the Subcommittee:

I am pleased to be here to discuss with you the improvements we have made over the past two years in the Environmental Management (EM) Office of Science and Technology (OST) program's development and effective deployment of innovative technologies to support the cleanup of the Department's nuclear weapons complex.

INTRODUCTION

The Office of Environmental Management's (EM) mission is to clean up the environmental legacy of U.S. nuclear weapons production and nuclear research. EM's goal is to complete as much of the cleanup as possible by the year 2006. But considerable cleanup will remain after 2006 focused on the most complicated and difficult problems. The EM cleanup effort is expensive, technologically complex, closely regulated, and relatively unique in the world. Achieving the goal of accelerated cleanup requires targeted investments in science and technology to respond to hundreds of needs identified by cleanup project managers at the affected sites.

EM's science and technology investments (a total of $243M in fiscal year 1999) have the potential to provide more effective, less expensive, more timely, and safer environmental remedies, including technologies where no effective remedies currently exist. These investments can also provide the data or

alternative approaches to reduce the risk that cleanup will be delayed or will exceed current cost estimates. Science and technology efforts within EM span the full spectrum from basic research to direct deployment assistance for cleanup projects and lead to fully integrated, technically defensible solutions for cleanup and long-term environmental stewardship at DOE sites. In order to maximize the value to the cleanup effort, EM's investments in science and technology must be effectively implemented across the DOE complex.

Approximately two years ago, your subcommittee held a hearing on the effectiveness of the OST program. At that time there was limited evidence that OST developed technologies were being deployed across the EM complex. During that hearing, your subcommittee also identified a number of concerns with the OST program: little or no involvement of the actual cleanup project managers with the selection, development, and implementation of new technologies; lack of a clear priority setting process for technology selection; lack of robust peer and merit review of science and technology investments; lack of effective measures to assess overall program performance; and lack of evidence that significant numbers of new technologies were being deployed in support of the Department's cleanup mission. We are here today to report that the Department took these criticisms very seriously, and as a result, EM has made a number of significant improvements in the management and integration of the OST program.

Over the last two years, OST and EM have substantially improved their technical and strategic planning processes. First, we developed policy and implemented new processes such as needs validation to assure that science and technology investments are driven by cleanup project managers. Second, we developed and are using a transparent, quantitative prioritization system for determining our science and technology investments; this system is wholly based on cleanup project data. Third, we instituted uniform and systematic peer and merit review systems; both are in place and working. Fourth, we established meaningful and challenging performance measures to assure that programmatic success can be demonstrated to regulators, state partners, and other stakeholders.

The net result of these changes has been a significant improvement in the way OST is managing our science and technology investments, which is evidenced in part by increasing deployment rates for innovative technologies across the DOE complex. With over 75 percent of the EM cleanup still ahead of us (in terms of estimated cost), the increasing deployment of innovative technologies should provide considerable opportunities for significant cost savings (i.e., billions of dollars) and schedule acceleration over baseline estimates. We are achieving results from our science and technology investments.

Achieving Results

In the past, the OST program has been criticized for the relative lack of deployments of new technologies across the DOE complex. I am pleased to report that we have turned the corner and are beginning to see the results of the investments we have made in science and technology. As with any science and technology initiative, substantial results cannot be expected overnight. We know that it takes at least several years to develop technology, gather needed supporting cost and performance data to demonstrate its utility and cost effectiveness under actual field conditions, and to make it ready for actual implementation. To accelerate the use of new technology in the EM cleanup effort, EM management of science and technology investments has evolved from a focus primarily on technology development prior to fiscal year 1996 to the more recent thrust toward deployment. The success of that strategy is now apparent.

OST-developed technologies, implemented by commercial vendors, are being used to clean up DOE sites across the country. From fiscal year 1991 through fiscal year 1998, almost 300 deployments of OST technologies took place at 30 DOE sites. While many of EM's cleanup issues are unique to DOE, there are some common problems shared with other federal agencies and organizations. To date, 32 deployments of OST-developed technologies have occurred at 28 non-DOE sites across the country and abroad. These sites include numerous military installations, Superfund sites, nuclear reactors, and various industrial sites.

For fiscal year 1998, EM committed to 49 first-time deployments of innovative technologies at DOE sites. This goal has been far exceeded and OST has played a major role in that success. DOE's Field Offices have reported 122 first-time deployments of innovative technologies in fiscal year 1998: 53 of non-OST technologies and 69 of OST-developed technologies. OST has conducted an intensive review of claims regarding its 69 technologies. To date, OST has verified that 55 of these first-time deployments utilized OST funded technologies at DOE sites. These 55 deployments, taken together with the 53 non-OST technology deployments, makes a total of at least 108 first-time DOE site deployments in fiscal year 1998. Considering only OST-developed technologies, in addition to the 55 first-time DOE site deployments, OST has also verified 49 subsequent technology deployments at DOE sites and 9 non-DOE site deployments, for a total of 113 deployments of OST sponsored technologies in fiscal year 1998. These 49 subsequent technology deployments reflect multiple usage of 18 OST sponsored technologies. Attachment 1 provides a list of OST developed technologies that contributed to meeting performance measures in fiscal year 1998.

More OST supported technologies are being deployed each year, and an increasing number of technologies are being deployed multiple times. Figure 1 below illustrates the increasing deployment trend for OST technologies. From fiscal year 1991 through fiscal year 1998, over 40 percent of OST's deployed technologies have been used more than once. Of the technologies with multiple deployments, 52 percent have been deployed 3 or more times. This increase in deployment of innovative technologies is contributing to schedule acceleration at many sites.

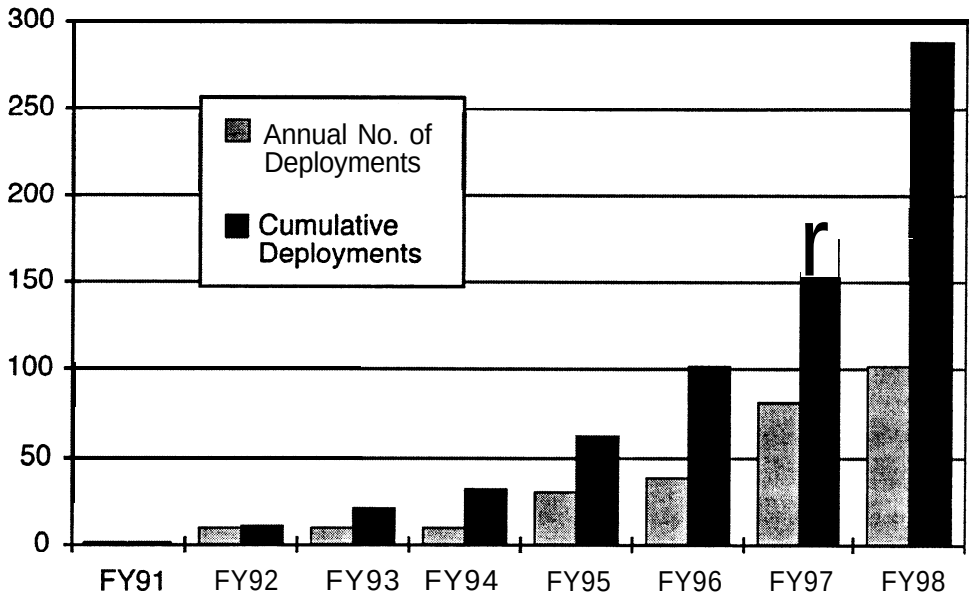

Figure 1. Cumulative Totals of OST Technology Deployments by Fiscal Year

In fiscal year 1998, OST initiated the Technology Deployment Initiative (TDI), now known as the Accelerated Site Technology Deployment (ASTD) initiative, to provide a means and incentive to promote the deployment of innovative technologies at multiple DOE sites. During fiscal year 1998, 14 projects, encompassing some 36 technologies, were started. By the end of fiscal year 1998, 13 deployments at 9 DOE sites occurred under 5 of these projects, with as many as 70 deployments projected over the next several years. Although the number of deployments for fiscal year 1998 was originally identified as 11 during testimony before the House Science Committee in March 1999, a final data review increased this by 2 deployments, to a total of 13. One particularly notable success under this program is the Segmented Gate System (SGS). The SGS, which reduces the volume of radioactively contaminated soils that requires disposal, was deployed at four DOE sites in one year under ASTD. For the original fourteen projects, over 60 private entities are providing products and services, of which approximately two-thirds are small businesses.

In fiscal year 1999, a total of 40 projects have been selected for initiation under the second round of the ASTD program. Technologies stemming from these projects are scheduled to be deployed at fifteen DOE sites, within one to two years of project start-up. Of particular note, the Hydrous Pyrolysis/Dynamic Underground Stripping (HP/DUS) technology will be used to clean up dense non-aqueous phase liquids (DNAPLs) in the subsurface at DOE's Portsmouth, Ohio facility, the Savannah River Site, and Lawrence Livermore National Laboratory in place of pump and treat technology.

In 1998, the General Accounting Office (GAO) reviewed EM's efforts to deploy innovative technologies. GAO found that OST's overall deployment rate is comparable to deployment rates at both the Environmental Protection Agency's Superfund Innovative Technology Evaluation Program and the Department of Defense's Environmental Security Technology Certification Program.

Although the results of our science and technology investments are beginning to payoff, there remain areas in which improvements are still needed. For example, the Office of the Inspector General (OIG) has recently released an audit report critical of several aspects of OST's efforts to deploy decontamination and decommissioning technologies. We have reviewed this report. We have determined what corrective action is needed to address the report's major findings and are beginning to implement those actions.

Strategic Planning

To ensure that we are working to achieve common science and technology goals, we developed the EM Strategic Plan for Science and Technology and the EM Research and Development Program Plan. These documents articulate a set of common goals and objectives, shared by the EM complex, for the science and technology programs within EM. They describe the relationship between the Department's missions, EM's specific missions, the programs established to accomplish these missions, the technical opportunities and barriers within these programs, and the science and technology investments needed to directly support EM's missions. But setting policy and having a plan are not sufficient; we must also be able to successfully execute our program as well. The OST Management Plan is one primary document

that we use to help execute the program. And one major requirement pervasive in all of these plans is that EM's science and technology investments must be driven by cleanup project managers, i.e., site managers responsible for on and under the ground cleanup, in order to have the maximum impact. At this point I want to elaborate on our major policy and programmatic changes.

Cleanup Project Managers Drive Science and Technology Investments

The first key policy decision we made was that cleanup project managers must drive science and technology investments for the OST program to be successful. Identification of cleanup project manager needs is the first step in the development of solutions to EM cleanup problems. Input from cleanup project managers is essential to accurately define and validate the needs to be addressed by EM's science and technology investments. Science and technology program needs are currently derived from needs developed by cleanup project managers and documented in "need statements," disposition map technology risk levels, critical pathway technology risk levels, and information contained in EM Project Baseline Summaries (PBS), i.e., relatively high-level project descriptions. Preliminary information for fiscal year 2000, for example, indicates that one-third of EM's cleanup projects and about 15 percent of the waste streams have technology needs associated with them. The majority, but not all, of these needs are currently being addressed by the OST program. The information also indicates the size (cost and extent) and complexity of the technical needs facing EM's science and technology program. They also identify the individual cleanup project manager, the schedule within which the solution must be available, and the impacts if these needs are not met.

Based on the cleanup project managers' input, OST's technical Focus Areas -- essentially, teams of Federal and contractor experts that concentrate on a major area of technical need, e.g. high-level waste tanks or deactivation and decommissioning of facilities -- begin an iterative process to develop fully integrated, multi-year technical responses to the site needs. The Focus Areas work closely with cleanup project managers to identify and document the specific science and technology requirements a solution

must meet. The Focus Areas establish problem area roadmaps, also known as multi-year program plans, to document the life-cycle planning for the solutions they are providing. In addition, the Focus Areas ensure that their technical responses are fully and completely integrated into the cleanup project manager's activities.

This process of integrated, joint planning is intended to ensure that budgets are adequate to support the technology development efforts; delivery schedules align with technology insertion points; and the cleanup programs have the financial and technical resources to support deployment of the new technology. Finally, ongoing science and technology projects are evaluated at key decision points to determine if an effort should be continued or if an alternate strategy should be adopted. Cleanup project managers are fully involved in these evaluations to ensure continued commitment to successful implementation of the solution.

Transparent, Quantitative Prioritization System for Project Selection

The second key policy decision we made was to use a transparent and quantitative system for establishing OST's workscope priorities based on data provided by our Field Offices. The complexity and duration of the EM cleanup effort requires OST to carefully prioritize and sequence science and technology projects. Our science and technology activities are now planned and managed in an interactive, coordinated and participatory relationship with EM's cleanup project managers and stakeholders. OST's prioritization process is iterative and integrative, beginning at the site problem level. EM's science and technology activities are pursued if and only if they:

- meet the highest priority cleanup project needs;
- reduce the cost of EM's costliest cleanup projects;
- reduce technology risk; and/or
- accelerate and increase technology deployment by bridging the gap between development and use.

Prioritization is first performed by the cleanup project managers, in the sense that only those OST technical responses that are endorsed by a cleanup project manager will be considered for integration and prioritization into each Focus Area's portfolio. Prioritization of technical activities is performed by each Focus Area, and then reviewed, revised if necessary, and approved by the Focus Area's User Steering Group, an oversight group charged with providing managerial oversight of the Focus Area's investment portfolio. Following this, the technical responses are compiled into work packages, which represent a set of related technical responses to site problems. A national, OST level prioritization process is then applied using a multi-attribute analysis, that includes the following factors: cost savings, technology deployment, site needs, and technical risk. The results of this process are then reviewed by the Department's Field Office Managers and EM's Deputy Assistant Secretaries to determine the final integrated priority list. This entire process has recently been reviewed and endorsed earlier this year by the Environmental Management Advisory Board (EMAB), an independent advisory group to EM. The EMAB concluded that OST's prioritization system was a transparent, robust quantitative prioritization system that is rooted in technology needs data supplied by project cleanup managers. We are committed to using this prioritization system to determine our portfolio of science and technology investments.

Peer and Merit Review Systems

The third key policy decision was to implement robust peer and merit review systems. Continuous internal and external review by peers and sponsors is generally recognized in the science and technology community as a necessary element of sound program evaluation and decision making. OST has put in place the review mechanisms and groups needed to assure the technical or scientific merit and programmatic relevance (potential to meet a cleanup project manager's needs) of its activities. Scientific merit review is performed by independent peer reviewers from universities and national laboratories, selected by the Department's Office of Science on the basis of their professional qualifications and

expertise. OST's Environmental Management Science Program has been recognized for the quality of its scientific peer review through receipt of a Vice-Presidential Hammer Award.

Technical merit reviews of specific technologies are conducted for OST by the American Society of Mechanical Engineers (ASME). ASME review panels provide independent, external evaluation of the technical merits of a technology. Through fiscal year 1998, ASME has conducted over 58 technology merit reviews for OST, with another 40 reviews planned to be completed by the end of fiscal year 1999. Programmatic relevance reviews are conducted by each Focus Area to evaluate research projects for programmatic relevance and technical, schedule, and cost performance. Programmatic relevance review panels include OST program managers, cleanup project managers, subject matter experts, stakeholder representatives, and technology developers, as appropriate. Finally, ad hoc reviews are conducted of the OST Program by the National Research Council/National Academy of Sciences (NRC/NAS) and the EMAB. These ad hoc reviews generally address broad program issues and help guide OST and EM in addressing problems of greatest significance to the Department.

Performance Measures

The fourth key policy decision was to use an effective set of performance measures at the corporate EM level to guide and evaluate our science and technology investments. Performance measures and the appropriate associated metrics are critical to the evaluation and ultimate success of any program. They can effectively drive the direction of any program and ultimately help it succeed. EM's performance measures associated with science and technology investments have evolved with the EM program and improvements in our understanding of how to most effectively use performance measures to achieve program goals.

Two years ago, at the time of our first hearing, EM was not measuring numbers of technology deployments or associated cost savings. That hearing catalyzed a number of changes to our performance measurement system. Over the past two years, we have developed a set of four corporate science and

technology measures that are sound, balanced, complement each other, and are reported by our customers at our Field Offices through the *Paths to Closure,* EM's corporate strategy document The first of these measures-- the number and impact of technology deployments-- was initiated in fiscal year 1998. Starting in fiscal year 2000, the following three measures will also be used:

- number of high priority site needs being addressed by science and technology activities
- reduction in programmatic risk resulting from science and technology activities
- life cycle cost savings resulting from science and technology activities.

These four measures are designed to assess both how well we are managing our investments in, and how effective we are in using the results from, our science and technology activities. These measures will enable us to:

- measure the impact of our science and technology investments in terms of deployment by tracking both the number of technology deployments and, more importantly, a quantitative or qualitative discussion of the value of the deployment in helping to meet site and state regulator objectives;
- use site needs to better target science and technology investments; to evaluate and track high priority site needs being addressed; and the science and technology solution to those needs that meet site schedule requirements;
- make the reduction of programmatic risk a priority for science and technology investments by tracking the reduction in programmatic risk (technological risk in particular) associated with the site critical closure paths and the management of contaminated media, waste streams, and materials; and
- improve our focus on the highest cost projects, set metrics and document the resulting life-cycle cost savings from EM's science and technology investments as part of our Project Baseline Summary life-cycle cost variance analysis.

These four measures are a balanced and logical approach to determining science and technology based contributions to accelerated cleanup goals. These four performance measures are so integral to the way

we are managing our science and technology investments that I want to discuss each of them in more detail.

Measure the effectiveness of our science and technology investments

EM started to track both the deployment of new technologies and the value of those deployments in 1997. EM established technology deployment as a corporate performance measure in 1998, asked the sites to review and comment on the data, and is currently improving the process for collecting, analyzing, and validating this data. EM is also working on better ways to capture the value and/or impact of deployments through qualitative descriptions rather than relying on simply the number of deployments. The number of deployments is a simple output measure. It implies that all deployments are of equal value and that the value is something worth measuring. In fact, deployments vary greatly in terms of impact on EM cleanup. For example, the Large Scale Demonstration Project at the Hanford 105-C-Reactor involved the demonstration of 20 innovative technologies, of which 15 were ultimately deployed, to provide for the safe storage of the C Reactor's core for up to 75 years until complete decontamination and decommissioning can be performed. While this project nets a count of 15 technology deployments (including a laser tracking and data system, the STREAM data management and integration system, and anti-contamination clothing for workers with a personal heat stress monitoring system to prevent overheating), the real impact of this project will stem from the benefits that can be applied to another 12 full-scale production reactors throughout the Department's nuclear weapons complex. **As** a second example, the deployment of the Out of Tank Evaporator, Light Duty Utility Arm, Fluidic Pulse Jet Mixer, Confined Sluicing End Effector, and Crossflow Filtration technologies at Oak Ridge net a simple count of 5 technology deployments, while masking the important baseline enabling and schedule accelerating effects of these tank waste cleanup technologies at Oak Ridge and potentially at Hanford and Savannah River.

Use site needs to target science and technology investments

In fiscal year 1999, the site science and technology needs are built directly into the cleanup projects. For the first time, we will have comprehensively integrated the cleanup projects and site needs and acquired direct user approval of OST's work packages at the project level. That is, we will have a solid understanding of the relationship between the approximately 400 cleanup projects, the 500 site needs, and the 40 Focus Area work packages or investments. This relationship serves as the baseline from which to measure progress. Focus Area efforts to meet or address EM's highest priority needs will be evaluated starting in 1999. Progress toward elimination of those needs will be measured starting in 2000. This data is reported by the cleanup project managers through the Project Baseline Summary structure established in the Paths to Closure, EM's corporate strategy document.

Make the reduction of programmatic risk a priority for science and technology investments

EM conducted an initial baseline of programmatic risk in 1998. This was done through two methods: the pathways and events associated with the site critical closure paths and the contaminated media, waste streams, and materials identified in the disposition maps. In 1999, we are baselining how EM's investments in science and technology correlate to those risk levels. In a manner similar to the site needs, as described above, we are mapping specific Focus Area work packages or investments, to specific critical pathways and events and particular streams on the disposition maps. The relationship between those elements and the risks associated with the elements provide us with our starting point or baseline from which to measure the effectiveness of the science and technology investments. That is, we must measure whether our investments are reducing programmatic risk and whether the programmatic risk is being reduced in those areas that are most important to the cleanup effort. This measure is also extremely effective in helping OST to target the investments; we now know the critical path and how we relate to it and by waste stream which problems we are trying to solve. In 2000, we will be able to start to measure

changes in the risk levels, for pathways, events, and disposition maps that are due to science and technology investments.

Improve our focus on the highest cost projects and document resulting cost savings

In 1998 EM's cleanup projects were baselined and accelerated cleanup goals were established. However, systematic tracking of science and technology based cost savings relies on EM's ability to document detailed, project-level progress towards accelerated cleanup goals. The 1999 *Paths to Closure* guidance starts to do exactly that. This year through a Project Baseline Summary Cost Variance Analysis Report we are requesting each of the projects to identify changes in projected life cycle cost. This analysis looks at the life-cycle cost from the previous year and provides an explanation of whether the life-cycle cost for the project has gone up or down and why. One of the reasons for the decrease in life-cycle cost is the application of science and technology to change or improve the technical approach to the cleanup activity. Using this data, we will be able to set metrics for cost savings targets starting in 2000. This data will be reported annually through the Project Baseline Summary structure.

The four complementary performance measures that we are implementing are user-owned and determined, are outcome-oriented, can be tracked over time, and relate directly to cleanup. Ensuring that the measures are user-owned was a key element in their development and will be key in their implementation and reporting. To meet this key element, we needed a set of corporate measures, not OST measures, which were reported by the Field Offices, through the project structure EM is currently using to manage and plan cleanup activities. The performance measures are outcome oriented and relate directly to the cleanup. That is, they report the solution to needs, the reduction in risk, and the achievement of cost savings that EM needs to meet site closure goals. These measures will be tracked on an annual basis using site information.

Although we believe we have the right performance measures in terms of driving the program to achieve certain goals, we have had difficulty in establishing the right metrics. When implementing a new

set of measures the availability of solid baseline data is critical to setting realistic but challenging metrics. The corporate measures we are implementing are based on data that was first available, in any form, in January 1998. The data will be available in a more useable form late in fiscal year 1999. Metrics development is a challenging task as is evident from our early efforts to pick a corporate level metric for deployment. We are considering the following factors in the development of metrics:

- numerical goals versus percentage goals to drive and evaluate performance;
- use of complete data sets or subsets of the data, e.g., technological risk of all the waste streams or just the high risk waste streams;
- annual goals versus life-cycle goals, e.g., should we analyze historical cost savings only or life-cycle cost savings; and,
- data collection methods available through *Paths to Closure.*

We believe these corporate measures are sound in terms of focusing the program and as tools for improved management. However, to allow proper analysis, that is, to successfully acquire the data for the measures and to evaluate performance, the metrics must be correctly crafted. This is a challenging task that we are still working on and each of these factors must be taken into consideration as we develop the specific metrics.

Other Concerns

During the last hearing before this committee, OST was criticized for the quality of its deployment and cost savings data. As a result, verifying technology deployments has been a key issue for us and we have been actively working to improve the quality of our deployment data. In fiscal year 1998, OST constructed Deployment Fact Sheets for every technology deployment that occurred from fiscal year 1995 through fiscal year 1998. These sheets were designed to both verify technology deployments and to disseminate information about the deployments (they are available on the inter-net at

http://ost.em.doe.gov/tms). Our highest priority has been placed on validating those deployments that occurred in fiscal year 1998.

We have conducted a validation effort, known as the Technology Achievement Study (TAS), on the fiscal year 1998 Deployment Fact Sheets. The TAS is conducted by an independent contractor under the direction of an OST Federal employee, who is not aligned organizationally with any of OST's technical Focus Areas. This assures that the TAS will remain free of conflict of interest. The TAS works directly with technology vendors and their DOE and non-DOE customers to verify the technology deployments reported on the Deployment Fact Sheets. Any discrepancies that are revealed by TAS are then resolved with the Focus Areas and the Field Offices, and any necessary changes are then made to the final Deployment Fact Sheets. As a result of the application of the TAS to the fiscal year 1998 deployment data, we have a high degree of confidence (>90%) in the quality of that data.

For the fiscal year 1998 deployments, we are also performing a one-time additional level of validation and verification. We have requested the Center for Acquisition and Business Excellence at the Federal Energy Technology Center to commission an independent audit of the fiscal year 1998 Deployment Fact Sheets. The draft results of this audit are anticipated by June 15, 1999.

OST continues to seek ways to improve the quality of deployment data and to verify the accuracy and completeness of current and future deployment information. Frankly, this is a difficult and expensive task, but one to which we are committed. During its 1998 review of the OST program, GAO contacted ten research and development organizations; not one of these organizations routinely tracked deployments. OST recognizes the importance of this data as an effective, albeit limited, performance measure and will continue to track deployments.

Cost Savings

Since we testified in May 1997, EM has taken a number of steps to improve the collection of cost savings data. In 1998, EM developed and distributed a standardized cost savings methodology for use in

calculating technology-based cost savings. In 1999, as part of EM's planning efforts, we established a data collection system for obtaining life-cycle cost savings data from the Field Offices on a project-by-project basis. Using this improved system will enable EM to identify, by project, where technology is being used to reduce the life-cycle cost of the cleanup, as well as where it isn't but needs to be. The standardized methodology and the data collection system support the implementation of technology-based cost savings as a corporate performance measure in fiscal year 2000.

Over the last two years EM has taken several steps to increase the amount of cost savings that result from our investments in science and technology. We have taken aggressive measures to accelerate the widespread use of new technologies. We are moving towards full integration of our efforts with the cleanup projects, and we are using the Field reported, and estimated, potential cost savings to prioritize work. Having said that, there are many factors that affect the actual cost savings that will result from these investments. These factors, including changes in regulatory requirements, the schedules and validity of existing baselines, and innovative approaches to contracting, make it difficult to either calculate or separate out what part of the cost savings was due specifically to a change in technology.

As noted in the *Paths to Closure* strategy document, remaining life-cycle cost of the EM cleanup is approximately $147 billion. While we are continuing to review our life-cycle cost estimates, we know that a major portion (>60%) of those costs will occur after 2006. In the intervening two years since our last hearing before this committee, we can confidently report to you an additional $300 million in projected life-cycle cost savings resulting from the deployment of some of our innovative technologies. Note that this figure represents the estimated savings from the use of twelve technologies and is not intended to reflect an exhaustive cost savings estimate of all our deployments since 1997. This figure of $300 million in projected life-cycle cost savings was developed by OST's Focus Areas working in conjunction with field office personnel; site concurrence has already been obtained for the majority of the estimated savings. Further, this figure of $300 million is in addition to the $400 million in cost savings that resulted from the deployment of OST developed technologies from the inception of the program

through fiscal year 1996, as previously reported to this subcommittee. Although this latter figure is difficult to validate precisely, it suggests that the rate of cost savings is increasing as new technologies achieve widespread deployment.

We continue to believe that science and technology investments are needed and estimate that the life-cycle cost savings at the end of the cleanup will be in the range of $10-20 billion. This range is based on projected life-cycle cost savings from innovative technologies identified in the fiscal year 1998 *Paths to Closure* strategy document and includes both technologies already incorporated into site baselines and technologies identified as potential substitutes for current baselines. These cost savings estimates were obtained from information provided by each field office for sites under its jurisdiction. It should also be noted that this range of $10-20 billion is in accord with other assessments of the potential life-cycle cost savings resulting from the use of innovative technologies; for example, EMAB estimated a potential life-cycle cost savings of approximately $10 billion; a study by the Los Alamos National Laboratory identified a potential life-cycle cost savings of $1 O-1 7 billion from the application of OST-developed technologies; in another assessment, OST estimated $24-34 billion; and the Army Corps of Engineers, in a review of the OST assessment, estimated a potential life-cycle cost savings of approximately $20 billion. In addition, the standardized cost savings methodology and the collection of cost savings data on a project by project basis will enable us to improve our understanding of the impact of these investments and help us to manage them better as well.

Moving; Forward

This subcommittee's hearing two years ago catalyzed the Department to improve the management of the OST program. We have made substantial progress in this area and are beginning to see the results. But much remains to be done. We have started, for example, to make better use of the Department's laboratories in this arena. A "lead laboratory" – a collection of subject matter experts coordinated by a specific national laboratory – is now providing direct deployment assistance as a part of OST's Focus

Area support to site cleanup managers. The goal of this is to enhance the technical and scientific knowledge of each Focus Area such that they become true "Centers of Expertise." These centers will provide valuable insight from basic research through deployment assistance. This process must be institutionalized within each of OST's Focus Areas.

In addition, we must also realize that the value of any science and technology program rests not merely with the hardware that it produces, but also with the value of the knowledge that it imparts. That is, science and technology investments do not always result in pieces of hardware that can be counted. Often the scientific data or the demonstration results allow the project manager to make a better and more informed decision. For example, the cleanup action level for mercury in the East Fork Poplar Creek in Tennessee was initially established at 5 parts per million (ppm). Research studies sponsored by OST, the Environmental Protection Agency (EPA), and the Electric Power Research Institute demonstrated that the risk from mercury contamination was low. As a direct result of this research finding, the cleanup action level for mercury was raised to 400 ppm. This increase was agreed to by the DOE, EPA, the State of Tennessee, and interested stakeholders. The net result of this change to the cleanup action level was a cost savings of at least $150 million and significantly reduced (75%) the amount of floodplain ecosystem destruction. A second example concerns the reduction of high-level waste glass volume at the Defense Waste Processing Facility (DWPF) at Savannah River. OST is currently funding research work that is directed towards understanding the fundamental properties of waste loading of high level waste glass. The aim of this research work is to enable an increase in waste loading of high level waste glass. For each 1 percent increase in waste loading that can be achieved, a total estimated cost savings of $250 million, due to schedule acceleration, can be realized over the life cycle of DWPF operations. The value and use of such scientific knowledge must come to be institutionalized.

Further, we must be vigilant in addressing the recommendations for improvement of the OST program provided by independent, external organizations. The recent OIG audit report, which was critical of OST's efforts to deploy decontamination and decommissioning (D&D) technologies through

large-scale demonstration projects, is a good example. That audit report documented four recommendations to improve deployment of D&D technologies: 1) require multi-site Federal and contractor representation on large-scale demonstration project teams; 2) require timely publication of the results of the large-scale demonstration project; 3) require that project management cost information be consistently collected and analyzed; and 4) centralize procurement for all contractor services on large-scale demonstration projects. We agree with these recommendations and the D&D Focus Area has provided formal guidance to the field sites to implement these recommendations.

Larger structural issues must also continue to be addressed and continuous program improvement achieved through, for example: rigorous application of our new performance measures; re-examination of our incentivization provisions for our site contractors with an eye toward stimulating further technological innovation; and further streamlining and improving the permitting processes for new technology. In an effort to deal with these larger structural issues, I believe that the following actions are necessary to continue and accelerate our improved performance:

- Our four new corporate performance measures – increase in the number and value of technology deployments; number of high priority needs met; reduction of technological risk levels; and achievement of life cycle cost savings – must be rigorously applied to continue to drive our science and technology investments in the right direction. Although we believe these are the right performance measures, we want the subcommittee's input, as well as GAO's, relative to the viability of these measures, and the actual metrics that are assigned to them, as effective tools for managing our science and technology investments. With your help, we will drive the OST program in the right direction through the application of the right performance metrics.
- The Department has already begun an integrated review of what is required to get to the next level of efficiency in the deployment of appropriate technologies at our sites. At the core, this entails having sufficient operational and cost data to allow for the development of performance incentives that will encourage and reward successful integration and deployment of appropriate technologies.

Joint development of the metrics accompanying our new performance measures is intended to generate this data. This is a complex problem requiring the input of many programs, agencies and stakeholders. Thus, special care must be taken to identify and allocate the risks and rewards appropriately between the vendors and the Department. Better incentive alignment is required. This applies to both the vendor and contractor community as well as our people, the project and site managers involved. This effort will be a joint undertaking by EM, Procurement and the Contract Reform/Privatization Office, and we expect an initial report by September 1999.

- An expansion of our current work with the Environmental Protection Agency through the Federal Remediation Technology Roundtable (FRTR), State regulatory groups, and other stakeholder groups. The FRTR is an interagency forum devoted to exploring policy and other issues related to environmental technologies and cleanup. Activities with the FRTR will be expanded to include consideration of improved permitting processes for innovative technologies. Ongoing efforts within the Interstate Technology Regulatory Cooperation (ITRC) program related to this issue will be continued and expanded, as will similar efforts with other groups.

Conclusion

In closing, we have turned the corner in our efforts to make the deployment of new technologies widespread through the DOE complex, but now we must institutionalize our gains and redouble our efforts; the deployment of new technologies must become routine and unfettered by other than non-technical issues. We will be continuing our efforts to expand the use of innovative environmental technologies in EM projects to reduce costs, reduce technical and safety risks, and accelerate the schedule of EM's cleanup program. We will continue to work with this subcommittee and advise you periodically of our efforts.